Four Pages of Nuclear Revelations

Exclusive Text: The AFL-CIO Protest Against the New Strontium 90 Safety Standards, See Page 3

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Strontium May Be 60 Times Deadlier Than the AEC Says

While the Atomic Energy Commission has just published new regulations which double the amount of strontium 90 regarded as a safe limit of exposure, a team of scientists in Sweden after ten years of study has come to the conclusion that this new man-made poison may be 60 times more dangerous to humans than the AEC assumes.

These findings—the result of a joint project by the Swedish Research Institute of National Defense and the Department of Medical Physics at Karolinska Institute—run counter to the new safety limits recommended by the National Committee on Radiation Protection. The way in which these recommendations were released to the press by the Department of Commerce last week has created the impression that strontium 90 is only half as dangerous as hitherto believed. *This implies that we are more concerned than necessary by the dangers from fallout.*

The Dangerous "Hot Spots" In The Bone

But the results which turned up (see adjoining box) when the Swedish scientists applied new methods of microscopic examination to strontium 90 in human bones indicate that the danger has been *underestimated*. Their findings—in brief—were that strontium 90 is so unevenly distributed in the bone structure that safety calculations based on averages are misleading. At certain "hot spots," the amount of SR90 may vary by sixty-fold from the average—and these spots—though tiny—may be enough to set off the beginnings of a cancer. The Swedish scientists concluded that safety standards must allow for this wide range of observable variation if they are really to protect nuclear workers and the public.

The fact that radiostrontium is not uniformly distributed in the bone structure is not a new observation. Some bones may have four times as much of the poison as others. The Swedish scientists, however, took the study of non-uniform distribution a step further. Cancer is a cellular disease. One malignant cell is enough to set off the deadly process. To understand fully the danger from radioactive isotopes it is necessary to study their distribution and effect in terms of the cell. Using autoradiographs and microradiographs, embodying the most sensitive techniques science possesses, the Swedish researchers were able to study the microscopic structure of the bone and "see" exactly where radioactive elements were lodged and in what proportions. They found that in terms of the cell the distribution of radioactive elements varied from six to 60 times the average. This means that while the body burden average may be within safe limits, certain cells may have as much as 60 times the average, and these cells may become malignant. They therefore concluded that safety limits must allow for these variations if they are to protect against cancer.

What the Swedes Discovered

"Dr. [W. O.] Caster would call attention to reference 7, the report of a Swedish investigation published in May 1958 [Bone and Radiostrontium by Arne Engstrom and others]. In his opinion, the conclusions of the Swedish study are based upon a very meticulous and elegant experimental work, and it is important in that it provides, for the first time, a direct but fairly rigorous calculation procedure for estimating the radiation dosage (in roentgen units) to be expected at various points in the skeleton of a person with known amounts of SR90 [radiostrontium] in his skeleton. It is known that SR90 is not homogeneously distributed throughout the skeleton, but is concentrated at certain points. Thus, any calculation relating to radiation dosage from SR90 must take into account the nonhomogeneity factor, N. The Swedish study tends to show that N is not a constant, but will vary with experimental conditions, and that at the present time it has a value much higher than any that had previously been assumed. The significance of this to the general public lies in the conclusion that SR90 is 60 times more dangerous to humans than AEC statements usually assume. . . ."

—Basic Data: the Minnesota Atomic Development Problems Committee, Addendum June 15, 1958.

The danger estimates and safety limits arrived at by the Swedish scientists differ strikingly from those now adopted by the AEC and the NCRP. They may be found dramatically contrasted in an article just published in the March-April issue of the *Minnesota Chemist*. The article is by Dr. W. O. Caster of the Department of Physiological Chemistry at the University of Minnesota, well known in his field. Here is a comparison in "sunshine units" from Dr. Caster's tables:

	Swedish	AEC
Population MPC	**3**	**200 S.U.**
Occupational MPC	**30**	**2,000 S.U.**
50-100% Increase Leukemia	**90**	**6,000 S.U.**
Bone Damage	**500**	**10,000 S.U.**
Bone Cancer Threshold	**750**	**50,000 S.U.**

(MPC is Maximum Permissible Concentration)

The actual data on which the Swedish results are based were published last year in Sweden and in this country *(Bone and Radiostrontium* by Arne Engstrom, Rolf Bjornerstedt, Carl-Johan Clemedson and Arne Nelson; published by John Wiley, New York) but little public attention has been paid them. Dr. Caster, summarizing in the *Minnesota Chemist,* said,

"The current AEC valuation would estimate that 180 SU would produce a radiation intensity in bone of 0.45 r/yr which is below the maximum permissible for the general population, and furnishes the skeleton with radiation only slightly above the natural background levels. Hence, it is 'safe' and well below levels that might cause biological effect or should rea-

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How the NPRC Withheld News of Population Safeguard Proposed by IPRC...

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sonably be termed a basis for concern. Using Engstrom's factor of N = 60, on the other hand, [N is the non-homogeneity factor in the safety equation—IFS], one would be led to say that 180 SU is about 60-fold above maximum permissible levels for the general population, and would double and perhaps triple a person's chances of having leukemia, and places him just above the threshold for bone damage."

More Research Urgent

Writing before the new safety standards were adopted, Dr. Caster continued, "This, briefly, describes the background of the problem faced by Subcommittee 2 of the National Committee on Radiation Protection and Measurement as it attempts to revise the maximum permissible level for the bone-seekers [like SR90]. In the interim there is honest confusion. No single value can claim universal acceptance as defining the border between hazard and safety. According to AEC logic, the old maximum figure of 100 SU is overly conservative and should be raised to 200 S.U. At the other extreme a figure as low as 3 SU could be justified. There is an urgent need for more research, and for a dispassionate application of what we already know." The committee has adopted the figure advocated by the AEC.

This brings me to a point which I respectfully suggest should be investigated by the Holifield subcommittee of the Joint Committee on Atomic Energy in the radiation hearings which open tomorrow (May 5). The subcommittee would perform a public service not only in bringing the Swedish findings to public attention but in determining what weight has been given them by the National Committee on Radiation Protection and by the International Commission on Radiological Protection in establishing the new safety standards. The press release issued by the Department of Commerce last week (see box below) on the new safety standards withheld from the public the fact that the International Commission suggested that the maximum permissible dose for general populations be held to one-hundredth of the occupational MPC for genetic hazards and to one-thirtieth of the occupational MPC for such somatic hazards as represented by strontium 90. The NPRC suggested instead that industry, in dealing with safety measures for the general population, could go on using the older ten percent standard. The NPRC and the AEC would thus allow 200 sunshine units to be used as the maximum for general population while the IPRC would reduce this to 60 sunshine units. There is reason to suspect that there has been a prolonged tug-of-war between the U. S. representatives on the International Commission and the others. The latter may have agreed to double the occupational MPC strontium 90 if the U. S. representatives in return would permit a general population MPC to be established at one-thirtieth of that figure. The National Committee has promulgated the doubling of the occupational safety standard but suspended application of the new population MPC.

Not Very Safe

"If bomb tests were to continue and a whole generation of children in the United States (100 million) were to receive this maximum permissible amount [10 percent of the 2 microcuries SR90 body burden newly set for occupational workers], about 100,000 of them would die of leukemia caused by this radioactive poison."

—Linus Pauling, letter to the New York Times, April 28 on the new strontium safety standards.

The Key to Those MPC's

Until now there have been two standards—a maximum permissible concentration for workers who come in contact with radioactive materials in nuclear plants and a maximum permissible concentration for others who live or work in the vicinity of nuclear plants. The latter figure is 10 percent of the former. The new SR90 standard, in terms of sunshine units are 2,000 and 200 respectively. This 10 percent figure has been used in the past as the general population standard governing waste disposal and purification problems, though strictly speaking—as the Dept. of Commerce press release admitted—the 10 percent figure should only be applied to the two or three percent of our population which lives or works in close proximity to nuclear operations. The problem of arriving at an MPC for the whole population involves many unknowns, including the long term effects of low level dosage and subtle problems of statistical analysis requiring much more data than we now possess to determine the curve of dis-

The Official Double-Talk on Population Safeguards and What It Hides

"Where radioactive material may escape from the controlled area and expose the neighboring public, the NCRP recommended in 1955 that the levels be 1/10 those for occupational exposure. This recommendation continues. It must be emphasized, however, that the factor of 1/10 is for the primary purposes of controlling the radioactive materials discharged from an operation involving the use of such materials. . . .

"Exposure of the whole population to natural and man-made sources of radiation presents a different problem and involves many factors beyond technical control. The NCRP reports, thus far, contain recommendations only on matters subject to control. The recommended values for MPC's [maximum permissible concentration] and MPD's [maximum permissible dose] apply specifically only to occupational conditions and conditions in the neighborhood of controlled areas. Until more specific information is available, it is believed that with the exercise of some judgment similar principles may be applied as guides in application to problems involving exposure of the whole population to radiation.

"The ICRP has made some tentative recommendations relative to whole population exposure. These are designed for long-range planning purposes and in this connection the NCRP considers them to be good. They are not, however, subject to direct control in the immediate future. In the meantime the NCRP considers that undue risks to the population will not be incurred by following current practices for a while longer. . . ."

—Press Release, Dept. of Commerce, (TRG-6245) on new radioactive safety limits, April 23, 1959.

What the release held back, while suggesting that the standard of one-tenth was good enough for general population protection, is that the ICRP last September 9 recommended that the safe limit for genetic hazard be 1/100th of the occupational standard and that for isotopes that concentrate in specific organs other than the gonads (like SR90) the safe limit be 1/30th.

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...Higher Safety Standards Opposed as Costly by Nuclear Industry Spokesmen

tribution in whole populations. The IRPC figure of one-thirtieth for somatic and one-hundred for genetic hazards would go a long way toward protecting against the uneven distribution of radioactive poison uncovered by the Swedish study of radiostrontium in the bone.

But the adoption of these MPC's for general populations would create problems at once for the military and for industry. If the population safety standard is to be one-thirtieth or one-hundredth respectively of the occupational MPC instead of one-tenth, then milk and water supplies in certain parts of the country will turn out to be uncomfortably close to the danger limits, perhaps even above them in some localities. This will add to pressure against further testing. From an industrial point of view, the adoption of the recommended population MPC's would be expensive. These, like all industrial safety regulations, add to costs. In nuclear industry they mean more shielding, medical supervision, finer filter and purification methods, higher insurance costs, more waste disposal expense and workmen's compensation problems.

Like Self-Regulated Industries

The National Committee on Radiation Protection, which recommends the basic safety standards for the growing nucleonics industry (as of last November 30, there were 1,463 industrial concerns licensed by the AEC to handle radioactive materials, an increase of 23 percent in one year), resembles the self-regulatory industry committees set up during the war. It is heavily weighted with representatives of nuclear industry, of the military agencies and of scientific agencies which work closely with them. Labor is not represented, though several hundred thousand workers are now employed in nuclear plants and they and their families have a life-and-death interest in safety standards.

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Does Secrecy Cloak A Worse Danger Than SR 90?

A tantalizing reference in a newly published scientific article seems to indicate that military censorship is hiding from the public a radioactive bomb debris danger greater than strontium 90. The article is "Strontium 90 Fallout in Minnesota" by Dr. W. O. Caster, Department of Physiological Chemistry, University of Minnesota. It has just appeared in the March-April issue of the Minnesota Chemist.

In discussing the radioactive debris of a nuclear explosion, Dr. Caster writes, "Biochemically we know very little about most of these elements. . . . Biologically the most dangerous among these may well be the unexpended fuel elements, U [Uranium] and P [Plutonium]. Detailed information on these is lacking—PERHAPS BECAUSE IT RELATES DIRECTLY TO BOMB EFFICIENCIES [emphasis added]. Next comes SR90."

This suggests that data on unexpended uranium and plutonium in bomb debris is withheld because it would provide intelligence on the efficiency of the bomb exploded.

Full Text of the AFL-CIO Protest Against the New Strontium Safety Limits

On April 24 the following letter of protest was sent by Benjamin C. Sigal, chairman of the AFL-CIO Industrial Union Dept. Atomic Energy Technical Committee to Senator Clinton P. Anderson, chairman of the Joint Committee on Atomic Energy. Since it was ignored by most of the press, we give the full text here:

"On April 23, 1959, a report was issued by the National Committee for Radiation Protection setting forth its latest revisions of the maximum permissible concentrations of radioactive materials in the human body and in air and water.

"These revisions gravely disturb us. They raise basic questions not only of scientific method, but of governmental procedure as well. While the NCRP has no governmental or official status, its recommendations are relied upon by government agencies as well as private organizations. You will recall that a short time ago questions were raised in testimony before you regarding the procedures followed by NCRP, and the validity of the standards they have set. The latest action of NCRP again brings this problem to the fore.

"The recommendations of the NCRP purport to be based on a 5-year study. The inference certainly is that sufficient information has been collected to warrant reliable scientific conclusions necessitating the revision of the previous standards. The fact of the matter appears to be, however, that the Committee does not have adequate information on which to base its conclusions. Its own statement declares:

" 'When we can measure more accurately the body burden of radioisotopes in the various body organs, we will have advanced further towards a practical solution of the problem.'

"This appears to us to be a confession that criteria and knowledge do not now exist by which reliable maximum permissible concentrations in the human body can be set. Under these circumstances it appears to be a highly dangerous business to double the limits for occupational exposure. We are constrained to suspect that issuance of these revisions at this time, following wide public concern over the extent and speed of radioactive fallout, is not a mere coincidence. If our suspicions are justified, the procedures of this Committee, to say the least, are open to question.

"In the past, the method of calculating the maximum permissible limit for each radioisotope was described by Dr. [K. Z.] Morgan as follows:

" 'For the most part these values are based on the assumption that the permissible amount of a radioisotope in the body is one which will result in the accumulation of the radioisotope in the critical body organ, such that the critical organ will be exposed at a rate of .3 rems per week.'

"In 1957, the permissible exposure rate was reduced to .1 rem per week. If the Committee were consistent, it should then have recalculated the permissible level of concentration based on that reduced exposure standard. They failed to do this.

"The release of the Committee fails to state, except in the most general terms, the nature of the information on which it has based its revisions. It is our understanding that this information is not now available to the scientific community.

"In the light of the extreme importance of this whole problem, we urge the Joint Committee on Atomic Energy to make a thorough investigation, at the earliest possible moment, into the methods by which the NCRP arrived at its conclusions. We urge the committee to demand that Dr. Lauriston Taylor present to your committee for publication the information upon which the NCRP revisions were made. We also urge your committee to examine the problem of whether or not the NCRP, a private organization, should provide the standards by which government agencies determine the possible limits of radiation exposure. In our view it is imperative that such a group should be under governmental direction."

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Strauss, at Commerce as in AEC, Master of Misleading Press Releases

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The Key Scientist Regulator

The key scientific figure in the regulatory picture is Dr. Lauriston S. Taylor. He is chairman of both the International Commission on Radiological Protection, which recommends world safety standards, and the National Committee on Radiation Protection, which recommends the way they shall be applied at home. Dr. Taylor is chief of the Atomic and Radiation Physics Division of the National Bureau of Standards, which is in turn part of the Department of Commerce, always a business-oriented part of the government. The Bureau of Standards publishes the safety handbook embodying the NCRP's recommendations. Since Admiral Lewis L. Strauss, formerly head of the AEC, is now Secretary of Commerce, awaiting final Senate confirmation, he is a commanding figure in this sector of the nuclear policy field, and Dr. Taylor's superior officer. The way the latest safety release was handled bears the familiar earmarks of the Admiral's press relations skill at the AEC. On the eve of the Joint Committee hearings, without scientific explanation, two months in advance of publication of the new handbook, the release was handled in such a way as to create quite false public impressions of the fallout danger.

Dr. Taylor himself has the nuclear industry point of view when it comes to safety problems. As chairman of the International Commission, he has been fighting a rear guard action against the promulgation of population MPC's and against the recent reduction of the general exposure level for radiation workers from 15 rems to 5 rems per year. On September 9, 1957, he told a Unesco conference in Paris that this reduction (which has since been put into effect) "could be very costly and could seriously retard the atomic energy industry." Last February 3, Dr. Taylor told the nuclear waste disposal hearings held by the Joint Committee on Atomic Energy that he saw "no serious risk" in suspending the application of the population maximums proposed by the IPRC last September 9. Of the proposed new safety standards, Dr. Taylor said "There is a very real danger if one keeps going down and down [i.e. lowering the permissible levels of exposure] that you will price us out of the adequate use of this new and very valuable tool." Dr. Taylor said he was fully in accord with another witness, the chief sanitary engineer of the Illinois Dept. of Public Health, who had testified on the importance of a "common sense" approach to radiation dangers in waste disposal 'lest the atomic energy business be "economically purified out of business."

Dr. Taylor, judging from his past speeches, seems to conceive his task as in part the job of protecting atomic industry from public pressure for greater safety precautions. This attitude seems to extend to the point of withholding vital information from the press. Dr. Taylor has given reporters the impression that the ICPR report was an almost secret document—"it won't be available here until June or July"—although it was reviewed in the *London Times* of April 17 and 1,000 copies consigned to the New York office of Pergamon Press, the publisher, were being help up in the New York customs office as we went to press. Fortunately, despite Dr. Taylor, we obtained a copy from London and learned what seems to be the most important item of information withheld—that the ICPR had recommended a population MPC for such poisons as SR90 at one-thirtieth of the occupational MPC. We hope the Joint Committee will ask Dr. Taylor why this fact was not included in the Commerce Department press release which gave rise to that *New York Times* headline, "Panel Downgrades Strontium 90 Peril."

The Men Who Set the New Standards Dominated by the AEC Crowd

The NCRP Subcommittee on Permissible Internal Dose which set the new safety standards for strontium 90 and other radioisotopes is made up of ten scientists. Four are AEC employes—K. Z. Morgan, the chairman, Oak Ridge; J. W. Healy, Hanford; L. D. Marinelli, and A. M. Brues, Argonne. Two others are well known for sharing the AEC point of view on testing and fallout: Lauriston S. Taylor of the National Bureau of Standards and Shields Warren of the New England Deaconess Hospital. The other four (we would appreciate hearing from any readers who know their basic point of view) are P. Durbin, Univ. of Calif.; G. Failla, Columbia; J. B. Hursh, Univ. of Rochester; and W. S. Snyder, Univ. of Tenn.

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